

PROJECT NUMBER: 1307
PROJECT TITLE: Reconstituted Tobacco Development
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PERIOD COVERED: April, 1989

I. IMPROVED SHEET PROPERTIES

A. Objective: Improve the physical characteristics and blend properties of reconstituted sheet materials.

B. Results:

1. ART Project - Expert panels have completed screening of the individual sheet materials containing ART stems. Equivalence to controls (individual RL types in 100% and blended cigarettes, and both RL types combined in blends) is indicated with ART stems incorporated as 1.8% of pilot RL feedstock. ART stems are less obvious in the TC flavored sheet, but are still detectable at 3.6% inclusion. Similar evaluations of BL Plant test RCB show that 11% ART stem inclusion is acceptable, but 22% is detectable. Semiworks cigarettes are in preparation to evaluate sheets with the recommended ART stem inclusion levels (1.8% in RL; 11% in RCB) combined in Marlboro blends, plus permutations of this formula, e.g., approximating 16% inclusion in RCB with a mix of the 11% and 22% sheets. The recommended blend would utilize 32% of the ART stems.

ART stems from the bottom absorber basket are subjectively better in RL than top basket stems, implicating the lipids ("wax") layer deposited on the top basket during pressure letdown. The wax-laden top layer of stems (2-3% of the stems) has been accumulated for analysis and will be subjectively evaluated in pilot RL. The non-wax portion (97-98%) of the stems has been made into RL to determine if this material is subjectively equivalent to bottom basket stems. Extensive chemical analysis has shown no measurable differences (other than alkaloids and citrate) between control CRS, monopotassium citrate cased CRS, total ART stems, top basket stems and bottom basket stems. Tandem mass spec analysis might detect chemical differences once this equipment becomes available.

Total ART stems that were thermally treated in the Semiworks Hauni HT tunnel were subjectively preferred over bottom basket stems in pilot RL (compared at 7.2% inclusion in feedstock). These stems have now been included in RL at 3.6% and 1.8% to confirm the benefits of Hauni treatment and to determine if this will allow higher ART stem inclusion levels.

ART stem inclusion in RCB (replacing burley stems) would require increased burley stem usage in RL to maintain durations. Control and ART stem pilot RL sheets will be made in this mode in May for use in blend combinations with ART stem RCB sheets. The ART stems will be Hauni treated if the testing in progress shows this to be subjectively beneficial.

2. Humectants - Preliminary results from subjective evaluation of the four PG/G-free blended cigarette models indicate potential acceptability for PG/G-free strip casings employing reduced isosweet levels (no sucrose); the three casing formulations using other natural flavors still showed differences versus controls. If these results hold, and no additional casing adjustments are necessary, a POL will be initiated using the low level isosweet casings.

C. Plans:

1. Expedite subjective evaluation of blend combinations of RL and RCB materials containing ART stems.
2. Determine if Hauni treatment improves ART stem subjectives and produce pilot RL with feedstocks adjusted to maintain stem durations with ART stem use in RCB.
3. Continue investigating the effects of the ART stem wax layer on sheet subjectives

II. SUBJECTIVE MODIFICATION OF RL

A. Objective: Improve or modify the subjective character of RL.

B. Results:

1. Liquid Flavors - Subjective screening of pilot 150B sheets made with liquid flavors from alternate vendors showed significant differences. The latest sample from Chart was subjectively unacceptable; the prior Chart samples had been consistent, and functioned as the control liquid flavor and the basis for setting specifications. The Takasago sample was acceptable; Takasago presently has only a pilot operation and scaleup to commercial will be required. One of the Madis samples was completely unacceptable (too roasted); the second sample was improved but still requires correction. Flavor Development will continue working with vendors to provide analytical feedback on new samples to be made after modifications to roasting/extraction conditions.

C. Plans:

1. Produce pilot 150B sheets to evaluate new liquid flavor samples once these become available.

III. PAPERMAKING TECHNOLOGY

A. Objective: Develop proprietary cigarette papers for low sidestream and other new product applications.

B. Results:

1. Handsheets - The handsheet lab produced trilayer sheets with filler combinations, bilayer and composite Smellrite (Union Carbide zeolite) papers, high (50%) carbonate sheets, bilayer 50%/0% carbonate papers, and papers filled with magnesium ammonium phosphate, precipitated dolomite, hydrotalcite, or hydrotalcite/calcium carbonate. Most handsheets were then sized with a potassium succinate solution. Handsheets were produced with methylcellulose or sol-gels added as a size or included in the sheet (added to the pulp slurry).

Sol-gels included in the paper slurry (Project Lotus) tend to retard drainage and reduce porosity without affecting paper physical properties. Sol-gels that were filtered, dried and ground showed a marked propensity to agglomerate in storage and when added to the fiber slurry. The first samples of sol-gel provided by New York Polytechnic University performed favorably; there was no obvious agglomeration, sheet formation was good, and the impact on stock drainage rates was much less. This material appears suitable for a pilot paper run at Maine if sidestream performance is acceptable.

2. Pilot Trials - Cigarettes made with Trim-V double-wrap papers, the Maine bilayer paper, and the Maine monolayer composite paper gave comparable sidestream reduction when adjusted for static burn time, indicating that reduction may be a function of the heavy sheet weight (63 gms/m²). In order to clarify this point, comparable monolayer composite papers at the same 63 gm weight are currently being produced at the University of Maine at three calcium carbonate loadings.

Bilayer handsheets (combined after free drainage) had indicated more effective sidestream reduction than composite handsheets. Sheet splitting results from Maine indicate some filler migration between the layers of the Maine papers, implying that bilayers may outperform double-wraps if the filler integrity of the layers can be maintained. This would require two fourdriniers and combining of the layers after free drainage, as opposed to the double headbox arrangement on a single wire as used at Maine.

The Trim-V cigarettes made from the double-wrap, Maine bilayer and Maine monolayer papers were all judged subjectively acceptable, with the bilayer paper preferred ("cleaner"). Marlboro Lights models have also been made with a Kimberly-Clark production paper and a comparable Maine paper in order to subjectively qualify the Maine flax stock and process.

The Maine magnesium carbonate/calcium carbonate bilayer paper was made into cigarettes and is scheduled for sidestream evaluation; subjective screening showed the characteristic magnesium off-taste. Handsheets with 30% hydrotalcite filler gave a black, weak ash; the hydrotalcite papers scheduled for Maine production were modified to a mixed filler of 15%

hydrotalcite and 15% calcium carbonate. Maine has committed to installing a vergeure roll on the second press (to provide watermark lines on the Maine papers) and a stock screen on the secondary headbox.

3. Other Support - The 23" rolls of paper coated with sol-gel at Western Michigan were slit into bobbins at Colonial Heights Packaging. The combination of humidification, redrying and tension during the slitting process removed most of the wrinkles and the appearance of the papers was much improved. The sol-gel patterns became glossy; pattern formation appears to be very sharp. Gravure press cells would have to be three times deeper to achieve the Project Tomorrow coating targets, and the ability of the paper to wick sol-gels out of the deeper cells may be limiting. Humidity control and the avoidance of overdrying may help to combat paper puckering during coating, but the high coating target weights and the high water content of sol-gels aggravate this problem. A non-aqueous sol-gel solvent that does not swell the paper fibers or disrupt sheet structure would alleviate this situation.

C. Plans:

1. Continue the preparation of handsheets to evaluate designed fillers and sol-gel preparations
2. Complete the production of heavyweight papers and papers containing hydrotalcite at the University of Maine.
3. Schedule the production of bilayer papers for the end of May at the University of Maine.